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Exploration of Individual and Family Factors Related to Community Reintegration in Veterans With Traumatic Brain Injury

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Abstract

BACKGROUND: Community reintegration (CR) poses a major problem for military veterans who have experienced a traumatic brain injury (TBI). Factors contributing to CR after TBI are poorly understood. **OBJECTIVE:** To address the gap in knowledge, an ecological framework was used to explore individual and family factors related to CR. **DESIGN:** Baseline data from an intervention study with 83 veterans with primarily mild to moderate TBI were analyzed. Instruments measured CR, depressive symptoms, physical health, quality of the relationship with the family member, and sociodemographics. Posttraumatic stress disorder and TBI characteristics were determined through record review. **RESULTS:** Five variables that exhibited significant bivariate relationships with CR (veteran rating of quality of relationship, physical functioning, bodily pain, posttraumatic stress disorder diagnosis, and depressive symptoms) were entered into hierarchical regression analysis. In the final analysis, the five variables together accounted for 35% of the variance, but only depression was a significant predictor of CR, with more depressed veterans exhibiting lower CR. **CONCLUSIONS:** Efforts to support CR of Veterans with TBI should carefully assess and target depression, a modifiable factor.

Keywords

traumatic brain injury, veterans, community reintegration, depression, posttraumatic stress disorder

Evidence suggests that community reintegration (CR) is a serious challenge for returning veterans with traumatic brain injury (TBI), as it is among civilians with TBI. CR reflects participation in family roles, in work or other meaningful activities, and in social relationships and the ability to live independently (Resnik, Bradford et al., 2012 ; Sander, Clark, & Pappadis, 2010). Although CR is the ultimate goal of rehabilitation after TBI (Doig, Fleming, & Tooth, 2001), little is known about correlates of CR in veterans with TBI. Thus, the purpose of this study was to explore individual and family factors related to CR in veterans with TBI. Identification of correlates of CR is critical to distinguish veterans at higher risk for CR problems and to guide development of interventions that target modifiable factors. In the present study, selection of possible correlates was guided by an ecological model that emphasizes the individual's interactions with the family, community, and society (Bronfenbrenner, 1979).

Literature Review

Traumatic Brain Injury in the Military

Traumatic brain injury, defined as trauma to the brain resulting in an alteration or loss of consciousness or post-traumatic amnesia (Carroll, Cassidy, Holm, Kraus, & Coronado, 2004), is common among soldiers in the Global Wars on Terror, occurring in an estimated 12% to 23% of returning soldiers (Hoge et al., 2008; Okie, 2006; Terrio et al., 2009; Warden, 2006). These brain injuries are caused by exposure to blast waves, mechanical injuries, or other service-related injuries, and most (about 80%) are categorized as mild in severity (O'Neil et al., 2012; Terrio et al., 2009). The increased prevalence of TBI among returning soldiers reflects better survival rates attributable to advances in protective equipment for soldiers and battlefield medical care (Okie, 2005; Tanielian, Jaycox, Adamson, & Metscher, 2008). Equipment such as Kevlar helmets have reduced the number of penetrating head injuries; however, they cannot provide complete protection for the face, head, and neck, nor can they prevent closed brain injuries, typically caused by blasts (Okie, 2005). Blasts from explosive devices are the most frequent cause of TBI in active duty military in war zones (Tanielian & Jaycox, 2008).

Medical and psychological sequelae of TBI may include impairments in memory, reasoning, concentration, organization, and attention; disturbances in mood, behavior, and interpersonal relationships; pain; dizziness; limitations in physical functioning; and sleep disturbances (Arciniegas, Held, & Wagner, 2002; Hoge et al., 2008; Kim et al., 2007; Rao & Lyketsos, 2000; Sayer et al., 2008; Schneiderman, Braver, & Kang, 2008). TBIs may disrupt many areas of functioning, and the impact of TBI on CR is receiving increased clinical and research emphasis. Interdisciplinary rehabilitation approaches involving nursing, medicine, neuropsychology, occupational therapy, social work, physical therapy, speech therapy, and others (e.g., Lew et al., 2007) aim to promote CR.

Community Reintegration

CR represents the premiere goal of rehabilitation after TBI (Doig et al., 2001), as well as the goal of rehabilitation in general (McCabe et al., 2007; Reistetter & Abreu, 2005). A multidimensional construct, CR encompasses participation in work, school, home, and other productive and meaningful activities; participation in social relationships and activities; and the ability to live independently (Resnik, Bradford et al., 2012; Salter, McClure, Foley, & Teasell, 2011; Sander et al., 2010). Varied conceptual and operational definitions exist, with the terms *community integration* and *community reintegration* often used interchangeably (Crocker, Powell-Cope, Brown, & Besterman-Dahan, 2014). In this article, we use the term *community reintegration*, referring to the veteran's return to the community after deployment in the military (Resnik, Bradford et al., 2012).

Problems in CR in civilians with TBI have been amply documented, such as decreased participation in employment (Dikmen et al., 1994; Kreutzer et al., 2003), household activities (Sander et al., 1999), parenting (Uysal, Hibbard, Robillard, Pappadopulos, & Jaffe, 1998), and recreational activities (Bier, Dutil, & Couture, 2009; Kersel, Marsh, Havill, & Sleigh, 2001) and decreased ability to live independently (Kersel et al., 2001). Furthermore, problems in the development and maintenance of friendships and intimate relationships after a TBI have been described (Burleigh, Farber, & Gillard, 1998; Morton & Wehman, 1995; Olver, Ponsford, & Curran, 1996), leading to social isolation and social activities being limited to interactions with immediate family members (Kersel et al., 2001).

Problems in CR in military personnel returning from deployment and in military personnel with TBI have been less studied. A recent report (Institute of Medicine, 2013) concluded that approximately 44% of returning troops have experienced difficulties in readjusting to civilian life after deployment. In a large national study of 754 Iraq and Afghanistan combat veterans receiving Veterans Affairs (VA) health services (Sayer et al., 2010), many veterans reported difficulties with CR within the past 30 days, such as difficulties in participation in community activities (49%), in relationships with intimate partners (42%), in relationships with children (29%), in doing what is needed for work or school (35%), and in maintaining nonmilitary friendships (45%). In addition, 57% reported problems since homecoming in controlling anger and job loss

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(24%). In another large study (Sayer et al., 2014) of 1,292 Iraq and Afghanistan War veterans, 62% of VA users and 45% of nonusers reported at least a little reintegration difficulty. In a study of 199 veterans referred for behavioral health evaluations (Sayers, Farrow, Ross, & Oslin, 2009), 75% reported problems in family reintegration during the previous week, such as feeling like a guest in their own home (41%) and being unsure of their family roles (37%). In a recent qualitative study (Kelly, Berkel, & Nilsson, 2014) of postdeployment experiences of female soldiers from the National Guard and Reserve units, the women described many CR challenges: complexity of civilian roles; loss of the military role, which was particularly painful for those without civilian jobs; reestablishing relationships with partners; and "being Mom again."

Research, albeit limited, suggests that reintegration is also challenging for combat veterans with a history of mild to severe TBI. In a qualitative study (Daggett, Bakas, Buelow, Habermann, & Murray, 2013) of veterans with mild TBI recently enrolled in VA health care, veterans described many difficulties in CR: decreased participation in leisure activity and major concerns about work, school, relationships, and the expectations of others. In Sayer et al.'s (2014) study, Iraq and Afghanistan War veterans who reported reintegration difficulty and used VA services were more likely to have probable TBI. In light of these emerging data, helping veterans with TBI to reintegrate within their communities is a priority within the VA Health System (Kupersmith, Ommaya, Selzer, Ruff, & Lew, 2009; Resnik, Bradford, et al., 2012).

Factors Related to CR

Research has examined correlates of CR in civilian and military populations among those with primarily moderate to severe TBI (Fleming, Tooth, Hassell, & Chan, 1999; Gordon et al., 2006; Hart, Whyte, Polansky, Kersey-Matusiak, & Fidler-Sheppard, 2005; Mascialino et al., 2009; Reistetter & Abreu, 2005; Schmidt, Garvin, Heinemann, & Kelly, 1995; Willemse-van Son, Ribbers, Hop, & Stam, 2009; Winkler, Unsworth, & Sloan, 2006). In contrast, correlates of CR in veterans with mild or mild to moderate TBI have received less attention and are poorly understood. Yet the large majority of TBIs are mild, representing 82% cases of military TBIs (Defense and Veterans Brain Injury Center, 2014) and 80% of civilian TBIs (Centers for Disease Control, 2014; Warden, 2006).

Study Purpose

To address the gap in knowledge, this study explored individual and family factors likely to be related to CR in veterans with primarily mild to moderate TBI. Selection of factors was guided by an ecological model (Bronfenbrenner, 1979). This model emphasizes the individual's interactions with the systems around him or her, specifically the family, community, and society, and therefore it is an appropriate conceptual model to study individual and family factors related to CR. Individual factors studied included physical functioning, bodily pain, depressive symptomatology, posttraumatic stress disorder (PTSD), time since the last TBI, TBI severity, and demographics. Family factors included type of relationship with the family member, quality of the relationship with the family member, number of children, number of children living at home, and family member depressive symptomatology. Identification of correlates of CR is a necessary first step to inform interventions that target modifiable factors.

The present study was part of a larger randomized controlled trial that evaluated the acceptability and effectiveness of the Veterans' In-home Program for veterans (on CR and functioning) and for families (on caregiver burden, mood, and satisfaction with the relationship). The program consists of an in-home intervention delivered by licensed occupational therapists. Data reported in this article were collected during the baseline interview with veterans. Randomization occurred after the baseline interview.

Method

Setting and Sample

The study was approved by the Institutional Review Board of the Philadelphia VA Medical Center. Veterans were recruited from the Philadelphia VA Medical Center outpatient Polytrauma Service that conducts TBI evaluations for veterans after an initial positive TBI screen. Post 9/11, veterans are automatically screened for TBI within the VA health system. Veterans from previous war cohorts are not routinely screened but can be referred to the Polytrauma Service for TBI evaluation through primary care, psychiatry, and other providers. Thus, all veterans in our sample, even those from earlier war cohorts, had recently received a TBI evaluation and TBI diagnosis through the Polytrauma Service.

Study participants included 83 veterans with TBI and for each, a family member selected by the veteran. An institutional review board–approved letter of invitation was sent to eligible veterans. Letters were followed by a phone call that explained the study further and confirmed the veteran's willingness and eligibility for the study. Inclusion criteria included residence in the Philadelphia metropolitan region, diagnosis of TBI at the Polytrauma Service, postdeployment from the Vietnam War era to the present, ability to speak English, meeting VA Polytrauma Systems of Care criteria for TBI, and having a family member or partner living with him or her or living within close proximity (within 30 minutes transportation time) willing to take part in the study. The family member was identified by the veteran as actively involved in his or her life. Exclusion criteria included that a veteran was currently at high risk for violence, as assessed by the clinical team in the Polytrauma Service.

Instruments

At the baseline interview with veterans and family members in the primary study, we obtained data from multiple measures. In this article, we report specifically on baseline data for veterans' CR, depression, physical health status (physical functioning and bodily pain), family factors (quality of veteran's relationship with the family member and depressive symptoms in family member), and demographics. We also report on data retrieved from the VA Computerized Patient Record System on war cohort and injury-related characteristics. To determine TBI severity, a study coinvestigator with expertise in rehabilitation medicine reviewed the veteran's electronic medical record and determined the TBI severity level using the *VA/DOD Clinical Guideline for Management of Concussion/Mild Traumatic Brain Injury* (http://www.healthquality.va.gov/guidelines/Rehab/mtbi/concussion_mtbi_full_1_0.pdf). According to these guidelines, TBI injury severity is stratified across three levels (mild, moderate, and severe) using five variables (reported findings on structural imaging based on radiographic reports, reported or documented length of time of loss of consciousness, reported or documented length of time of alteration of consciousness, reported or documented length of time of posttraumatic amnesia, and the Glasgow Coma Scale score at the time of the injury or injuries). For our study population, the Glasgow Coma Scales scores were unavailable; however, data for the other four variables were consistently available in electronic medical records. When three or four of the variables were reported or documented as falling within the specified severity level, then this level was assigned (mild/moderate/severe); if one or two variables fell across two or three specified severity levels, then the level was assigned as "transitional" in severity (mild to moderate, moderate to severe). Thus, the sample is described across five levels of severity: mild, mild to moderate, moderate, moderate to severe, and severe. Although this approach is not usually taken during clinical TBI severity assignment when applying these guidelines, it did provide a more refined description of severity stratification of our study sample.

Community Reintegration. CR was measured using 12 items from the Community Reintegration for Service Member instrument (CRIS; Resnik, Plow, & Jette, 2009) and three investigator-developed questions. CRIS has the advantage of having been developed for military samples. However, this lengthy multidimensional instrument, consisting of 147 items, includes items measuring health, general self-care, and functioning as part of CR. Health, self-care, and functioning were measured in the present study with other tools. To minimize construct confusion, redundancy, and research burden, we selected extent of participation as the core construct of CR and used 12 items from the CRIS Extent of Participation subscale that concern extent of participation in activities with family, friends, and the community. We did not use items from the other CRIS subscales, which measure perceived limitations in participation and satisfaction with participation, because frequency of participation is viewed as a more objective measure of participation (M. Brown et al., 2004). Examples of items in our CR measure (from the CRIS) included: "How often were you in contact with your family (other than the people you live with)?" "How often did you get together with friends?" "How often did you help friends, neighbors, or relatives that did not live with you?" Three additional questions that captured participation in work and school, and having a friend in whom to confide were added, for example, "What is your current work situation (during the past 2 weeks)?" and "Please choose the answer that best corresponds to your current school or training program." Veterans were asked how often they participated in or experienced certain activities within the past 2 weeks, using response formats from 1 (*not at all*) to 6 (*always*). Because three items had different response formats, z scores were computed and used in the regression analysis. Cronbach's alpha for our veteran sample was .71.

Independent Variables. Veteran and family member depressive symptomatology was measured with the Center for Epidemiologic Studies Depression (CES-D) scale, the CES-D short form (Andresen, Malmgren, Carter, & Patrick, 1994), a 10-item screening instrument with well-established psychometric properties that assesses the frequency of each symptom in the past week. The response format for each item ranges from 0 (*never or rarely*) to 3 (*every day*); the possible range of scores is 0 to 30, with higher scores representing greater degrees of depressive symptomatology. A cutoff score of 10 or higher indicates the presence of significant depressive symptoms. Cronbach's alpha for this veteran sample was .85 and for the family member sample was .83.

The Short Form Health Survey for Veterans–36 (SF-36V; Kazis, 2000) was administered to obtain information on the veteran's physical health status. Its 36 items measure 8 health concepts, but we selected 2 subscales, physical functioning and bodily pain, to measure physical health status. High scores indicate fewer limitations. Reliability and validity have been well established

(Kazis, 2000). Cronbach's alpha for the SF-36V physical functioning subscale for our veteran sample was .90 and for the bodily pain subscale was .86.

The quality of the veteran's relationship with the family member (the member who took part in the study) was assessed through the veteran's self-report, using the Mutual Communal Relationship Scale (Williamson & Schulz, 1990, 1995; Williamson & Shaffer, 2001), a 10-item questionnaire that asks about the quality of the relationship between the veteran and the family member, including level of reciprocity in the relationship, mutual demonstrations of concern, and desire to respond to the other's needs. The original scale elicited information about the relationship before one member became ill. In this study, the scale was adapted to ask about the "type of interactions you have with this family member." For each item, the subject was asked to "indicate which response you feel most accurately describes how you and he/she interact these days" on a Likert-type scale from 1 (*never*) to 4 (*always*). Cronbach's alpha for this veteran sample was .80.

PTSD was measured as the absence or presence of a PTSD diagnosis documented during the study period—from the time the veteran provided written consent to the time the veteran completed the follow-up interview. Documentation was retrieved through review of the electronic medical record.

Procedure

Veterans and family members were interviewed in their home on the same day. The two interviews were conducted separately, outside the hearing of the other, to maintain independent responses.

Data Analyses

Sample Description and Zero-Order Associations. Descriptive statistics to characterize the sample were generated, followed by descriptive statistics for veteran CR, depressive symptoms, rating of quality of the relationship, physical functioning, bodily pain, and PTSD and for family member depressive symptoms. Bivariate relationships between individual and family factors and CR were examined with zero-order associations. Only variables with correlations with CR at the $p < .10$ level were entered into hierarchical multiple regression.

Hierarchical Multiple Regression. Five variables showed significant zero-order correlations with CR: one family factor (veteran's rating of quality of relationship) and four individual veteran factors (physical functioning, bodily pain, PTSD, and depressive symptoms). Hierarchical multiple regression was performed to assess how the addition of each block contributed to the variance in CR after controlling for the effects of the predictors previously entered (Cohen & Cohen, 1983). The family factor (quality of relationship with the family member) was entered in the first block; two individual factors (physical functioning and bodily pain), both representing physical health, were entered in the second block. Quality of relationship and the physical health variables were viewed as background variables. PTSD diagnosis and depressive symptoms, representing individual mental health factors, were entered in the third block to assess how they contributed to the variance in CR after controlling for the contribution of the predictors in Blocks 1 and 2. All analyses were conducted with SPSS, Version 20.

Results

Sample Characteristics

Table 1 describes demographic characteristics of veterans and family members. Veterans' mean age was approximately 40 years with a range between 23 and 67 years. The sample consisted largely of White veterans, and Black veterans constituted about one third of the sample. Most veterans were male. The majority was married and had children. Only about one third of the veterans were employed.

Table 2 provides information about veterans' war cohort, source of TBI, number of TBI incidents, level of TBI severity, psychiatric comorbidities (depression and PTSD), time since first and most recent TBI, and prevalence of major TBI-related symptoms. Most participants were veterans from Operation Iraqi Freedom, followed by those from Operation Enduring Freedom (from Afghanistan war). Sources of the TBI varied, with almost one third of veterans suffering both blast and mechanical injuries. Over one third had experienced multiple TBIs (>4), and about one third reported one TBI incident. Approximately two thirds of our sample had a PTSD diagnosis that was documented as active in the veteran's medical record during the time between the veteran's giving informed consent and completing the follow-up interview. Furthermore, 58% had a depression diagnosis documented during this period, and 50% of the sample was in treatment for depression during this period.

Descriptive Statistics

Table 3 shows descriptive statistics for CR, veteran depressive symptoms, family member depressive symptoms, quality of relationship, physical functioning, bodily pain, and PTSD. The mean depression score for veterans

Table 1. Sociodemographic Characteristics of Veterans and Family Members.

	Veteran			Family Member		
Characteristics	*M* (*SD*)	Range	% (*n*)	*M* (*SD*)	Range	% (*n*)
Age	40.1 (13.0)	23-67		41.8 (12.5)	21-67	
Gender (% male)			91.6 (76)			7.2 (6)
Education						
Less than high school degree			6.0 (5)			3.6 (3)
High school degree or GED			24.1 (20)			27.7 (23)
Some college			45.8 (38)			41.0 (34)
College degree			16.9 (14)			16.9 (14)
Postdoctoral degree			7.2 (6)			10.8 (9)
Marital status (% married)			69.9 (58)			84.3 (70)
Years married	12.1 (10.2)	1-40		13.7 (11.5)	1-41	
Have children			75.9 (63)			83.1 (69)
No. of children	2.5 (1.8)	0-8		2.5(1.4)	0-7	
No. of children at home	1.1 (1.1)	0-4		1.6 (1.2)	0-5	
Financial well-being[a]	1.6 (1.1)	0-3		1.4 (1.0)	0-3	
Employed			34.9 (29)			63.9 (53)
Race						
White			57.8 (48)			60.2 (50)
Black			34.9 (29)			31.3 (26)
Native American			2.4 (2)			0 (0)
Asian			1.2 (1)			3.6 (3)
No primary			1.2 (1)			2.4 (2)
Other			2.4 (2)			2.4 (2)
Hispanic/Latino			13.3 (11)			12.00 (10)
Relationship of family member to veteran						
Spouse/partner						71.1 (59)
Mother						15.7 (13)
Sister						3.6 (3)
Brother						1.2 (1)
Other						8.4 (7)

Note. GED = general educational development.

[a] How difficult is it to pay for the basics? Scale of 0 (*not at all*), 1 (*not very*), 2 (*somewhat*), and 3 (*very*).

indicates that the veteran sample had on average a significant level of depressive symptoms, higher than the cutoff of 10, which is deemed as the screening threshold for depression (Andresen et al., 1994). Furthermore, 89% of our veteran sample had a CES-D score at or above 10, indicating the presence of significant depressive symptoms. The mean depression score for family members ($X = 9.72$) was lower than the mean for veterans but still close to the cutoff value of ≥ 10.

Regression Analyses: Predictors of CR

In correlational analyses (Table 4), demographic variables (age, gender, education, and race), family factors (number of children, number of children living at home, type of relationship, and family member depressive symptomatology), and other veteran factors (time since last TBI, TBI severity) were not significantly correlated with CR. Zero-order associations among potential predictors revealed the absence of multicollinearity among variables. Five variables with bivariate relationships with CR (at $p < .10$), specifically veteran rating of the quality of relationship, physical functioning, bodily pain, PTSD diagnosis, and veteran depressive symptoms, were entered into hierarchical regression analyses.

The results of the hierarchical regression are presented in Table 5. In Block 1, the veteran's rating of the quality of the relationship with the family member was a significant predictor of CR and explained 6.5% of the variance in CR. However, quality of the relationship was no longer significant in Block 2 when physical functioning and bodily pain were entered. Addition of the two physical health variables to the model explained a statistically significant increment in the variance of CR, but only physical functioning was

Table 2. Characteristics of Veterans: War Cohort, TBI Severity, Time Since TBIs, Source of Injuries, Number of TBI-Related Events, Comorbidity, and Major Symptoms (*n* = 83 Veterans).

Characteristics	% (*n*)	*M* (*SD*)	Range (*n*)
Severity		1.64 (1.12)	1-5
1 mild	68.7 (57)		
2 mild-moderate	12.0 (10)		
3 moderate	10.8 (9)		
4 moderate-severe	3.6 (3)		
5 severe	4.8 (4)		
War cohort[a]			
OIF (Iraq)	61.4 (51)		
OEF (Afghanistan)	22.9 (19)		
Both OIF and OEF	10.5 (9)		
Dessert Storm (Persian Gulf)	6.0 (5)		
Vietnam War	7.2 (6)		
Post–Vietnam War era	10.8 (9)		
Stateside injury	4.8 (4)		
Years since first TBI		11.99 (11.32)	1.0-45.0 (59)
Years since most recent TBI		9.99 (11.09)	1.0-45.4 (83)
Source of TBI injury[a]			
Blast	53.0 (44)		
Mechanical	72.3 (60)		
Struck/thrown against object	18.1 (15)		
Fall	28.9 (24)		
Vehicular	32.5 (27)		
Sports	9.6 (8)		
Equipment malfunction	2.4 (2)		
Assault/hazing by fellow service members	2.4 (2)		
Other	8.4 (7)		
Both blast and mechanical	32.5 (27)		
Number of TBI-related incidents			
1	31.3 (26)		
2	15.7 (13)		
3	7.2 (6)		
4	4.8 (4)		
Multiple (>4)	36.1 (30)		
Unknown	4.8 (4)		
Frequency of TBI-related symptoms[a]			
Pain	67.5 (56)		
Tinnitus	25.3 (21)		
Photosensitivity	20.5 (17)		

Note. TBI = traumatic brain injury; OIF = Operation Iraqi Freedom; OEF = Operation Enduring Freedom.
[a]Does not add to 100% because some were in more than one category.

significant. With the addition of the individual mental health factors to the equation in Block 3, physical functioning no longer remained significant, and PTSD was also not significant. Block 3 resulted in a further significant increment in explained CR variance; however, only the depressive symptom score was a significant predictor of CR, with veterans with higher depressive symptoms exhibiting lower CR. The five variables as a set contributed to 35.4% of the variance in CR.

Discussion

Guided by an ecological model, this study explored potential family and individual factors contributing to CR in veterans with TBI. Findings revealed depressive symptoms to be the sole significant predictor of CR when the family factor along with individual physical health factors and PTSD were entered into the model. Discussion of our findings revolves around four main areas: sample comparisons, the central role of depression as a predictor

Table 3. Descriptive Statistics for Community Reintegration, Depressive Symptoms, Quality of Relationship, Physical Functioning, Bodily Pain, and PTSD Diagnosis.

Variables	*M* (*SD*)	Range	%
Community reintegration	2.06 (.78)	0.60-4.07	
Depressive symptomatology (veteran)	18.36 (6.27)	2.00-30.00	
Depressive symptomatology (family member)	9.72 (6.10)	0-24.00	
Quality of the relationship	3.08 (.52)	1.60-4.00	
Physical functioning	8.12 (5.10)	0-18.00	
Bodily pain	5.60 (2.36)	0-9.00	
PTSD diagnosis			65.1

Note. PTSD = posttraumatic stress disorder.

of CR, study limitations, and implications of the findings for practice and research.

Comparison of Our Sample to Others

Our veteran sample, drawn from veterans diagnosed with TBI in an outpatient VA Polytrauma Service, included a high percentage of veterans with active clinical diagnoses of depression and PTSD. The prevalence of a depression diagnosis in our sample was higher than the rate of 45% seen in a large study of 22,053 Iraq and Afghanistan War veterans with TBI who used VA health care in 2009 (Taylor et al., 2012) and higher than the average prevalence rate of 42% observed in TBI studies in a review article (Kreutzer, Seel, & Gourley, 2001). About half of our sample was receiving treatment for depression during the study period, and the vast majority had a CES-D score indicating significant depressive symptoms. Our findings, from a sample with primarily mild TBI, indicate that depression is not limited to persons with moderate to severe TBI; it also occurs in those with mild TBI as others have concluded (Fann et al., 2004; Hoge et al., 2008). The prevalence of a PTSD diagnosis in our sample of veterans with TBI comes close to the rate of 73% in Taylor et al.'s (2012) study and to the rate of 68% seen in a smaller sample of 340 veterans with TBI treated in a VA Polytrauma Network Site (Lew et al., 2009).

Depression as a Predictor of CR

With the addition of PTSD diagnosis and depressive symptoms into the final regression analysis, only depressive symptoms independently predicted CR; veterans with more depressive symptoms had lower CR. The findings suggest the powerful contribution of depressive symptoms to CR in this sample and corroborate previous studies showing relationships between depression after TBI and CR problems. Social problems, which reflect problems in CR, have been correlated with increased major depression in persons earlier and later after TBI (Gomez-Hernandez, Max, Kosier, Paradiso, & Robinson, 1997; Hibberd et al., 2004; Jorge et al., 1993; Jorge et al., 2004; Malec, Testa, Rush, Brown, & Moessner, 2007). Depression soon after a TBI has been associated with impaired close relationships in persons with varied severity levels of TBI (Gomez-Hernandez et al., 1997) and associated with unemployment in persons with severe TBI (R. M. Ruff et al., 1993). A significant inverse relationship between depression and CR has also been reported in persons with mild to moderate TBI at 3 months postinjury (Levin et al., 2001) and in persons with mild TBI 3 years after the trauma (Stalnacke, 2007).

Depression after a TBI arises from a complex interaction among neurological, psychological, and social factors (Williams & Evans, 2003). Although depression is a common consequence of TBI (Seel et al., 2003), a recent review (Jorge & Arciniegas, 2014) concluded that current treatments for depression after TBI are largely guided by expert opinion rather than by rigorous controlled trials. Our findings underscore the central role of depression in CR and reinforce the need for evidence-based treatments that aim to reduce depression in persons with TBI and thereby improve CR. Because CR is a central goal of rehabilitation, early assessment and interventions for depression are also essential in improving the success of rehabilitation services after TBI (Moldover, Goldberg, & Prout, 2004). Because the risk of depression remains elevated for decades after a TBI (Holsinger et al., 2002; Koponen et al., 2002) and associated problems in CR may also continue, our findings suggest that assessment and treatment of depression should be ongoing for many years after a TBI.

Some symptoms of depression and PTSD may occur concurrently with a TBI, making it difficult to differentiate effects of multiple conditions (R. L. Ruff, Riechers, & Ruff, 2010; Sayer, 2012; Wall, 2012). Some symptoms that patients attribute to TBI may be related to comorbid mental or physical health problems (O'Neil et al., 2012). Calls for the development and testing of collaborative approaches that address TBI along with comorbid mental

Table 4. Zero-Order Correlations Among Variables (n = 83).

Variables	Age	Gender[a]	Education	Race[b]	No. of children	No. of children at home	Quality of relationship	Relationship type[c]	CES-D (family)	Physical function	Bodily pain	Time since TBI	TBI severity	CES-D (veteran)	PTSD
Age	—														
Gender[a]	.048	—													
Education	.035	.235	—												
Race[b]				—											
No. of children	.316**	.016	−.065	.084	—										
No. of children at home	−.014	−.003	−.106	−.095	.382**	—									
Quality of relationship	.109	.263	.142	.021	−.120		—								
Type of relationship[c]	.177	−.285	−.038	−.155	.090	.334**	−.097	—							
CES-D family member	.120	−.194	.033	−.050	.294*	.016	.140	.216*	—						
Physical functioning	.224*	.078	−.084	.033	.171	.171	−.161	.088	.083	—					
Pain	−.013	.181	.000	−.074	.301*	.301**	.012	.096	.075	.610**	—				
Time since last TBI	.635	−.129	−.106	.026	.208	−.007	.054	.154	.076	.255*	−.022	—			
TBI severity	.021	−.045	−.048	.030	−.044	−.157	−.146	−.060	.038	.071	−.136	−.005	—		
CES-D (veteran)	.117	−.094	−.115	−.085	.106	.258*	−.285	.122	.080	.417**	.291**	.195	−.073	—	
PTSD	−.050	−.323	−.070	−.193	.079	.253	−.249	.201	.054	.217*	.081	.067	−.240	.359**	—
Community reintegration	−.037	.154	.038	.011	.084	.155	.255*	−.098	−.059	−.391***	−.192, p = .08	−.115	.103	−.557***	.359**

Note. CES-D = Center for Epidemiologic Studies Depression Scale; TBI = traumatic brain injury; PTSD = posttraumatic stress disorder.
[a]0 = male, 1 = female. [b]White or other. [c]Spouse or other.
*p < .05. **p < .01. ***p < .001.

Table 5. Hierarchical Multiple Regression Results: Predictors of Community Reintegration.

						Change statistics		
Predictors	B (*SE*)	β	*t*	*p*	R^2	R^2 change (*df*)	*F*	*p*
Block 1					.065	.065 (1, 81)	5.628	.020
Quality of relationship	.218 (.092)	.255	2.372	.020				
Block 2					.192	.127 (2, 79)	6.196	.003
Quality of relationship	.164 (.088)	.192	1.859	.067				
Physical functioning	−.033 (.011)	−.385	2.947	.004				
Bodily pain	.008 (.024)	.041	0.317	.752				
Block 3					.354	.162 (1, 78)	19.602	.000
Quality of relationship	.073 (.082)	.085	0.882	.380				
Physical functioning (limitations)	−.021 (.011)	−.239	1.956	.054				
Bodily pain	.016 (.022)	.087	0.744	.459				
PTSD	−.141 (.090)	−.154	−1.564	.122				
CES-D Veteran (depressive symptoms)	−.032 (.007)	−0.459	−4.427	.0001				

Note. df = degrees of freedom; PTSD = posttraumatic stress disorder; CES-D = Center for Epidemiologic Studies Depression Scale.

health problems of depression and PTSD are emerging in the literature (Carlson et al., 2011; Hoge et al., 2008; Otis, McGlinchey, Vasterling, & Kerns, 2011; Tanev, Pentel, Kredlow, & Charney, 2014).

Because about two thirds of our sample had experienced mild TBI and 12% had mild to moderate TBI, our findings offer insight into correlates of CR in veterans with mild and mild to moderate TBI. Our data showing depression as the sole predictor of CR in a sample with primarily mild TBI are particularly relevant, given that the rate of depression in persons with mild TBI is 7.9 times greater than that in the general population (Bombardier et al., 2010). Depression in persons with mild TBI interferes with their physical and cognitive rehabilitation (Rapoport, McCullagh, Streiner, & Feinstein, 2003), also supporting the clinical significance of our findings.

An alternative interpretation of our findings around directionality of the relationship between depression and CR should be acknowledged. Although our model and previous studies suggest that depression influences CR, it is possible that improved CR leads to reduced depression. Longitudinal studies that have related depression to aspects of functioning in persons with TBI have found that functioning predicted later depression but depression was unrelated to later functioning (Pagulayan, Hoffman, Temkin, Machamer, & Dikmen, 2008; Schonberger, Ponsford, Gould, & Johnston, 2011). This is an area for further research, as the question of directionality arises in cross-sectional research.

Other Tested Predictors of CR

The veteran's rating of the quality of his or her relationship with the family member, although a significant predictor in the first block, was no longer significant when the individual physical health factors were entered in Block 2; only physical functioning was significant in the second block. The association between quality of the relationship, as defined in our study, and CR has not been examined in previous TBI research and warrants further investigation in multivariate analyses. Physical functioning approached significance in the final analysis, suggesting that veterans with more limitations in physical functioning may exhibit lower CR, a finding consistent with other studies (e.g., Resnik, Borgia, Pensheng, Pirraglia, & Jette, 2012; Resnik et al., 2009). Limitations in vigorous activities, moderate activities, walking, climbing stairs, carrying groceries, and dressing/bathing, as measured by the SF36-V subscale, may make it more difficult for veterans with TBI to travel and to participate in varied activities, particularly outside the home. Possibly, some veterans may need assistance traveling to activities in the community as a way to promote their CR.

PTSD was not a significant predictor of CR in our final regression analyses. Previous studies have reported significant bivariate associations among CR, PTSD, and depression among returning veterans (Resnik et al., 2009) and among civilians with TBI (Bryant, Marosszeky, Crooks, Baguley, & Gurka, 2001; Stalnacke, 2007). Our study results suggest that multivariate analyses are helpful in teasing out the independent contribution of depression to CR when controlling for PTSD.

Demographic variables (age, gender, education, race), other family factors (number of children, number of children at home, type of relationship, family member depressive symptoms), and other veteran factors (time since last TBI, TBI severity) were not significantly correlated with CR in bivariate analyses. Although previous studies have provided some evidence for age, gender, race, education, and severity of injury as correlates of CR (Fleming et al., 1999; Gordon et al., 2006; Hart et al., 2005; Mascialino et al., 2009; Reistetter & Abreu, 2005; Schmidt et al., 1995; Willemse-van Son et al., 2009; Winkler et al., 2006), most samples in these studies consisted of persons with moderate to severe TBI, which could help explain different findings in our sample with primarily mild or mild to moderate TBI.

Strengths and Limitations

This study obtained a veteran sample that was diverse in terms of age, race, war cohort, and time since the last injury, thus increasing the generalizability of findings. Notably, neither severity of TBI (mild to severe) nor time since last injury (1.0-45 years), despite the wide range in the sample, was significantly associated with CR, and thus controlling for these factors was not necessary. The diagnosis of TBI and its severity level were based on clinical interviews with specialists, considered the gold standard for an accurate TBI diagnosis (R. Ruff, 2005; Taylor et al., 2012), and based on a careful review of multiple data sources in the electronic medical record. Therefore, it is unlikely that the insignificant correlations were due to unreliable diagnosis.

Findings should also be interpreted in light of several limitations. First, findings in this cross-sectional study are correlational, and causality cannot be inferred. Second, the sample consisted of veterans willing to participate in an intervention study, raising the potential for selection bias that could influence generalizability. Third, veterans who did not have a family member living with them or within close proximity willing to take part in the study were excluded from the study. Thus, findings cannot be generalized to these veterans who may be more isolated and have lower CR resulting from lower family interaction. Fourth, study findings can only be generalized to veterans with primarily mild to moderate TBI who are in a VA clinical setting. They may not be applicable to civilians with TBI in outpatient rehabilitation settings and to those with less psychiatric symptomatology. Findings may also not be generalizable to Operation Enduring Freedom/Operation Iraqi Freedom veterans or other veterans with TBI who do not access VA health care. Although the VA health system is mandated to provide free care for 5 years for all Iraq and Afghanistan veterans with a service-connected condition (U.S. Department of Veterans Affairs, 2011), only 58% of these eligible veterans have used VA care since 2001 (U.S. Department of Veterans Affairs, Epidemiology Program, 2104). Another limitation was that our measure of CR included only 12 items from the 147-item CRIS instrument, and thus the psychometric properties of the CRIS do not apply to our CR measure. However, Cronbach's alpha with our modified tool was acceptable, and a relationship between depression and CR was found, which is theoretically expected and confirmed by previous studies. Shorter versions of the CRIS (Resnik, Borgia, et al., 2012) became available after initiation of our study. At our study's inception, there was no widely accepted instrument that was a "gold standard" for measuring veterans' CR (Resnik, Gray, & Borgia, 2011). Last, our study did not employ a standardized PTSD instrument that would have enabled measurement of severity of PTSD symptoms as a continuous variable. Our PTSD measure consisted of a current clinical PTSD diagnosis (absent or present) determined through review of the electronic medical record. However, the PTSD diagnosis found in the medical record was derived from clinicians' interviews with patients, which is considered reliable (Skodol & Bender, 2000). Despite the limitations acknowledged here, our study offers a unique contribution in illuminating factors related to CR in veterans with primarily mild and mild to moderate TBI in a VA polytrauma setting, thus advancing the very limited knowledge in this area.

Implications for Practice and Future Research

Efforts to support CR of veterans with TBI should carefully assess and target depression. Psychiatric nurses, other nurses, and other clinicians should employ well-validated screening tools as standard clinical assessments in outpatient and inpatient settings as a first step toward improved recognition, referral, and treatment of depression in patients with TBI. Measurement of depression at regular intervals in persons with TBI would enable early recognition of new onset depression as well as detect changes in depression over time. Recommendations for how clinicians in VA and non-VA settings can improve diagnosis of depression in patients with TBI are important contributions to clinical practice. For example, Seel, Macciocchi, and Kreutzer (2010) describe primary features of major depressive disorder along with empirical findings on how these features are manifested in persons with TBI. They also provide clinicians with recommendations to improve the diagnosis of major depression in persons with TBI.

Depression is a modifiable factor that is often amenable to treatment. Interventions such as behavioral activation target both depression and enhancement of activity (an aspect of CR). These types of interventions particularly warrant future testing with veterans with mild to moderate TBI. However, veterans with TBI and depression may be reluctant to seek mental health services because of concerns around stigma, negative beliefs about mental health treatment, and military cultural values around strength (Vogt, 2011). Integration of mental health services within a polytrauma rehabilitation service may be more acceptable to these veterans (O'Neil et al., 2012). Integration of mental health care within VA primary care may also facilitate mental health assessments and care of veterans with TBI (Pomerantz & Sayers, 2010). Innovative reintegration programs that reframe mental health treatment to a focus on strengthening family relationships, parenting, and relationships within the community may also increase engagement of veterans with TBI and their families in mental health services (Ross & DeVoe, 2014). Development and evaluation of these types of programs—addressing mental health issues within the context of TBI—are particularly needed, given gaps identified in returning soldiers' access to mental health services and gaps in the delivery of quality care (Tanielian et al., 2008; Tanielian & Jaycox, 2008). The biopsychosocial and spiritual perspective of psychiatric advanced practice nurses and other mental health providers will be critical to the development of such programs.

Intervention programs designed to enhance CR in returning veterans with TBI are increasing (e.g., Murphy & Fairbank, 2013; Trudel, Nidiffer, & Barth, 2007). An overwhelming 96% of 1,226 Iraq and Afghanistan veterans in one study (Sayer et al., 2010) expressed interest in services to assist them to readjust to civilian life, with preferences toward services through the VA, online, or mail. Programs that respond to this need and that include consideration of veterans' mental health issues, such as depression, are timely and responsive to veterans.

Given that about one-half of veterans do not seek care from the VA health system (U.S. Department of Veterans Affairs, Epidemiology Program, 2014), it is imperative that nurses and other clinical staff in non-VA systems ask every patient about his or her veteran status and subsequently assess veteran patients for problems with higher prevalence in veterans, including TBI, depression, PTSD, and CR challenges. The simple question, "Have you ever served in the military?" is essential in every health history (American Academy of Nursing, 2014; J. L. Brown, 2012). Without this level of systematic assessment in private settings, many problems in veterans will be underdiagnosed and undertreated.

This study should be replicated with larger samples that include civilians and veterans in VA and non-VA settings and persons with mild to moderate TBI to ascertain whether depression remains a strong predictor of CR in other samples. Qualitative and mixed-method studies that aim to explain how depression affects CR are also needed. Authors of a 2014 review on the state of the science on CR in returning veterans (Crocker et al., 2014) have called for more qualitative and mixed method approaches to illuminate barriers and facilitators to CR, which would encompass mental health and other factors. Also valuable would be longitudinal studies that elucidate predictors of CR at different time periods and that tease out temporal relationships among variables to advance knowledge of the long-term process of CR. Finally, but most important, research that elicits the aspects of CR that are most meaningful to veterans and civilians with TBI and their families is critical to incorporate patient and family-centered outcomes in services designed to enhance CR.

Conclusion

Overall, significant gaps remain in our understanding of CR and correlates of CR in veterans with TBI, particularly in veterans with mild to moderate TBI. The central role of depression observed in our sample is clinically meaningful and compelling, and underscores the need for replication in future research.

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Author Roles

Helene Moriarty and Laraine Winter: developed proposal; led study, data analysis, data interpretation, and writing of the article. Keith Robinson: proposal development, data collection and interpretation, assisted with preparation of the article. Gala True: proposal development, assisted with preparation of the article. Catherine Piersol: interventionist, assisted with preparation of the article. Tracey Vause-Earland: interventionist, assisted with preparation of the article. Dolores Blazer Iacovone: provided OT expert advice in data interpretation and review of the article. Laura Holbert: research interviewer, assisted in data interpretation, review of the manuscript. Brian Newhart: recruitment, provided polytrauma social worker expertise in data interpretation, review of the manuscript. Deborah Fishman: provided mental health expertise in data interpretation, review of the manuscript. Thomas Short: provided statistical expertise in data analyses and interpretation and input into the manuscript.

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References

American Academy of Nursing. (2014, September 11). *Bob Woodruff Foundation and the Academy join forces for Veterans health* [Press release]. Retrieved from http://www.aannet.org/index.php?option=com_content&view=article&id=717:bwf—the-academy-join-forces-for-vet-health&catid=23:news&Itemid=133

Andresen, E. M., Malmgren, J. A., Carter, W. B., & Patrick, D. L. (1994). Screening for depression in older adults: Evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). *American Journal of Preventive Medicine*, *10*, 77-84.

Arciniegas, D. B., Held, K., & Wagner, P. (2002). Cognitive impairment following traumatic brain injury. *Current Treatment Options in Neurology*, *4*, 43-57.

Bier, N., Dutil, E., & Couture, M. (2009). Factors affecting leisure participation after a traumatic brain injury: An exploratory study. *Journal of Head Trauma Rehabilitation*, *24*, 187-194.

Bombardier, C. H., Fann, J. R., Temkin, N. R., Esselman, P. C., Barber, J., & Dikmen, S. S. (2010). Rates of major depressive disorder and clinical outcomes following traumatic brain injury. *Journal of the American Medical Association*, *303*, 1938-1945.

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Cambridge, MA: Harvard University Press.

Brown, J. L. (2012). A piece of my mind: the unasked question. *Journal of the American Medical Association*, *308*, 1869-1870.

Brown, M., Dijkers, M. P., Gordon, W. A., Ashman, T., Charatz, H., & Cheng, Z. (2004). Participation objective, participation subjective: A measure of participation combining outsider and insider perspectives. *Journal of Head Trauma Rehabilitation*, *19*, 459-481.

Bryant, R. A., Marosszeky, J. E., Crooks, J., Baguley, I. J., & Gurka, J. (2001). Posttraumatic stress disorder and psychosocial functioning after severe traumatic brain injury. *Journal of Nervous and Mental Disease*, *189*, 109-113.

Burleigh, S. A., Farber, R. S., & Gillard, M. (1998). Community integration and life satisfaction after traumatic brain injury: Long-term findings. *American Journal of Occupational Therapy*, *52*, 45-52.

Carlson, K. F., Kehle, S. M., Meis, L. A., Greer, N., MacDonald, R., Rutks, I., . . . Wilt, T. J. (2011). Prevalence, assessment, and treatment of mild traumatic brain injury and posttraumatic stress disorder: A systematic review of the evidence. *Journal of Head Trauma Rehabilitation*, *26*, 103-115.

Carroll, L. J., Cassidy, J. D., Holm, L., Kraus, J., & Coronado, V. G. (2004). Methodological issues and research recommendations for mild traumatic brain injury: The WHO Collaborating Centre Task Force on Mild Traumatic Brain Injury. *Journal of Rehabilitation Medicine*, *43*(Suppl.), 113-125.

Centers for Disease Control. (2014). *Traumatic brain injury in the United States: Fact sheet*. Retrieved from http://www.cdc.gov/traumaticbraininjury/get_the_facts.html

Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum.

Crocker, T., Powell-Cope, G., Brown, L. M., & Besterman-Dahan, K. (2014). Toward a veteran-centric view on community (re)integration. *Journal of Rehabilitation Research & Development*, *51*(3), xi-xviii.

Daggett, V. S., Bakas, T., Buelow, J., Habermann, B., & Murray, L. L. (2013). Needs and concerns of male combat Veterans with mild traumatic brain injury. *Journal of Rehabilitation Research & Development*, *50*, 327-340.

Defense and Veterans Brain Injury Center. (2014). *DOD Worldwide numbers for TBI*. Retrieved from dvbic.dcoe.mil/dod-worldwide-numbers-tbi

Dikmen, S. S., Temkin, N. R., Machamer, J. E., Holubkov, A. L., Fraser, R. T., & Winn, H. R. (1994). Employment following traumatic brain injuries. *Archives of Neurology*, *51*, 177-186.

Doig, E., Fleming, J., & Tooth, L. (2001). Patterns of community integration 2-5 years post-discharge from brain injury rehabilitation. *Brain Injury*, *15*, 747-762.

Fann, J. R., Burington, B., Leonetti, A., Jaffe, K., Katon, W. J., & Thompson, R. S. (2004). Psychiatric illness following traumatic brain injury in an adult health maintenance organization population. *Archives of General Psychiatry*, *61*, 53-61.

Fleming, J., Tooth, L., Hassell, M., & Chan, W. (1999). Prediction of community integration and vocational outcome 2-5 years after traumatic brain injury rehabilitation in Australia. *Brain Injury*, *13*, 417-431.

Gomez-Hernandez, R., Max, J. E., Kosier, T., Paradiso, S., & Robinson, R. G. (1997). Social impairment and depression after traumatic brain injury. *Archives of Physical Medicine and Rehabilitation*, *78*, 1321-1326.

Gordon, W. A., Zafonte, R., Cicerone, K., Cantor, J., Brown, W., Lombard, L., . . . Chandna, T. (2006). Traumatic brain injury rehabilitation: State of the science. *American Journal of Physical Medicine & Rehabilitation*, *85*, 343-382.

Hart, T., Whyte, J., Polansky, M., Kersey-Matusiak, G., & Fidler-Sheppard, R. (2005). Community outcomes following traumatic brain injury: Impact of race and preinjury status. *Journal of Head Trauma Rehabilitation*, *20*, 158-172.

Hibberd, M. R., Ashman, T. A., Spielman, L. A., Chun, D., Charatz, H. J., & Melvin, S. (2004). Relationship between depression and psychosocial functioning after traumatic brain injury. *Archives of Physical Medicine and Rehabilitation*, *85*(4 Suppl. 2), S43-S53.

Hoge, C. W., McGurk, D., Thomas, J. L., Cox, A. L., Engel, C. C., & Castro, C. A. (2008). Mild traumatic brain injury in U.S. soldiers returning from Iraq. *New England Journal of Medicine*, *358*, 453-463.

Holsinger, T., Steffens, D. C., Phillips, C., Helms, M. J., Havlik, R. J., Breitner, J. C., . . . Plassman, B. L. (2002). Head injury in early adulthood and the lifetime risk of depression. *Archives of General Psychiatry*, *59*, 17-22.

Institute of Medicine. (2013). *Returning home from Iraq and Afghanistan: Assessment of readjustment needs of veterans, service members, and their families*. Washington, DC: The National Academies Press.

Jorge, R. E., & Arciniegas, D. B. (2014). Mood disorders after TBI. *Psychiatric Clinics of North America*, *37*, 13-29.

Jorge, R. E., Robinson, R. G., Arndt, S. V., Starkstein, S. E., Forrester, A. W., & Geisler, F. (1993). Depression following traumatic brain injury: A 1 year longitudinal study. *Journal of Affective Disorders*, *27*, 233-243.

Jorge, R. E., Robinson, R. G., Moser, D., Tateno, A., Crespo-Facorro, B., & Arndt, S. (2004). Major depression following traumatic brain injury. *Archives of General Psychiatry*, *61*, 42-50.

Kazis, L. E., (2000). The Veterans SF-36 Health Status Questionnaire: Development and application in the Veterans Health Administration. *Medical Outcomes Monitor*, *5*, 1-17.

Kelly, P. J., Berkel, L. A., & Nilsson, J. E. (2014). Postdeployment reintegration experiences of female soldiers from National Guard and Reserve units in the United States. *Nursing Research*, *63*, 346-356.

Kersel, D. A., Marsh, N. V., Havill, J. H., & Sleigh, J. W. (2001). Psychosocial functioning during the year following severe brain injury. *Brain Injury*, *15*, 683-696.

Kim, E., Lauterbach, E. C., Reeve, A., Arciniegas, D. B., Coburn, K. L., Mendez, M. F., . . . Coffey, E. C. (2007). Neuropsychiatric complications of traumatic brain injury: A critical review of the literature (a report by the ANPA Committee on Research). *Journal of Neuropsychiatry and Clinical Neurosciences*, *19*, 106-127.

Koponen, S., Taiminen, T., Portin, R., Himanen, L., Isoniemi, H., Heinonen, H., . . . Tenovuo, O. (2002). Axis I and II psychiatric disorders after traumatic brain injury: A 30 year follow-up study. *American Journal of Psychiatry*, *159*, 1315-1321.

Kreutzer, J. S., Marwitz, J. H., Walker, W., Sander, A., Sherer, M., Bogner, J., . . . Bushnik, T. (2003). Moderating factors in return to work and job stability after traumatic brain injury. *Journal of Head Trauma Rehabilitation*, *18*, 128-138.

Kreutzer, J. S., Seel, R. T., & Gourley, E. (2001). The prevalence and symptom rates of depression after traumatic brain injury: A comprehensive examination. *Brain Injury*, *15*, 563-576.

Kupersmith, J., Ommaya, A. K., Selzer, M. E., Ruff, R. L., & Lew, H. L. (2009). Guest editorial: Traumatic brain injury research state-of-the-art conference. *Journal of Rehabilitation Research & Development*, *46*(6), xvii-xviii.

Levin, H. S., Brown, S. A., Song, J. X., McCauley, S. R., Boake, C., Contant, C. F., . . . Kotrla, K. J. (2001). Depression and posttraumatic stress disorder at three months after mild to moderate traumatic brain injury. *Journal of Clinical and Experimental Neuropsychology*, *23*, 754-769.

Lew, H. L., Otis, J. D., Tun, C., Kerns, R. D., Clark, M. E., & Cifu, D. X. (2009). Prevalence of chronic pain, posttraumatic stress disorder, and persistent postconcussive symptoms in OIF/OEF veterans: Polytrauma clinical triad. *Journal of Rehabilitation Research & Development*, *46*, 697-702.

Lew, H. L., Poole, J. H., Vanderploeg, R. D., Goodrich, G. L., Dekelboum, S., Guillory, S. B., . . . Cifu, D. X. (2007). Program development and defining characteristics of returning military in a VA Polytrauma Network Site. *Journal of Rehabilitation Research & Development*, *44*, 1027-1034.

Malec, J. F., Testa, J. A., Rush, B. K., Brown, A. W., & Moessner, A. M. (2007). Self-assessment of impairment, impaired self-awareness, and depression after traumatic brain injury. *Journal of Head Trauma Rehabilitation*, *22*, 156-166.

Mascialino, G., Hirshson, C., Egan, M., Cantor, J., Ashman, T., Tsaousides, T., & Spielman, L. (2009). Objective and subjective assessment of long-term community integration in minority groups following traumatic brain injury. *NeuroRehabilitation*, *24*, 29-36.

McCabe, P., Lippert, C., Weiser, M., Hilditch, M., Hartridge, C., & Villamere, J. (2007). Community reintegration following acquired brain injury. *Brain Injury*, *21*, 231-257.

Moldover, J. E., Goldberg, K. B., & Prout, M. F. (2004). Depression after traumatic brain injury: A review of evidence for clinical heterogeneity. *Neuropsychological Review*, *14*, 143-154.

Morton, M. V., & Wehman, P. (1995). Psychosocial and emotional sequelae of individuals with traumatic brain injury: A literature review and recommendations. *Brain Injury*, *9*, 81-92.

Murphy, R. A., & Fairbank, J. A. (2013). Implementation and dissemination of military informed and evidence-based interventions for community dwelling military families. *Clinical Child and Family Psychology Review*, *16*, 348-364. doi:10.1007/s10567-013-0149-8

Okie, S. (2005). Traumatic brain injury in the war zone. *New England Journal of Medicine*, *352*, 2043-2047.

Okie, S. (2006). Reconstructing lives: A tale of two soldiers. *New England Journal of Medicine*, *355*, 2609-2615.

Olver, J. H., Ponsford, J. L., & Curran, C. A. (1996). Outcome following traumatic brain injury: A comparison between 2 and 5 years after injury. *Brain Injury*, *10*, 841-848.

O'Neil, M. E., Carlson, K. F., Storzbach, D., Brenner, L. A., Freeman, M., Quinones, A., . . . Kansagara, D. (2012). *Complications of mild traumatic brain injury in veterans and military personnel: A systematic review*. Retrieved from http://www.ncbi.nlm.nih.gov/books/NBK189785/

Otis, J. D., McGlinchey, R., Vasterling, J. J., & Kerns, R. D. (2011). Complicating factors associated with mild traumatic brain injury: Impact on pain and posttraumatic stress disorder treatment. *Journal of Clinical Psychology in Medical Settings*, *18*, 145-154.

Pagulayan, K. F., Hoffman, J. M., Temkin, N. R., Machamer, J. E., & Dikmen, S. S. (2008). Functional limitations and depression after traumatic brain injury: Examination of the temporal relationship. *Archives of Physical Medicine and Rehabilitation*, *89*, 1887-1892.

Pomerantz, A. S., & Sayers, S. L. (2010). Primary care-mental health integration in the Department of Veterans Affairs. *Families, Systems, & Health*, *28*, 78-82.

Rao, V., & Lyketsos, C. (2000). Neuropsychiatric sequelae of traumatic brain injury. *Psychosomatics*, *41*, 95-103.

Rapoport, M. J., McCullagh, S., Streiner, D., & Feinstein, A. (2003). The clinical significance of major depression following mild traumatic brain injury. *Psychosomatics*, *44*, 31-37.

Reistetter, T. A., & Abreu, B. C. (2005). Appraising evidence on community integration following brain injury: A systematic review. *Occupational Therapy International*, *12*, 196-217.

Resnik, L., Borgia, M., Ni, P., Pirraglia, P. A., & Jette, A. (2012). Reliability, validity and administrative burden of the community reintegration of injured service members computer adaptive test (CRIS-CAT). *BMC Medical Research Methodology*, *12*(145). Retrieved from http://www.biomedcentral.com/1471-2288/12/145

Resnik, L., Bradford, D. W., Glynn, S. M., Jette, A. M., Johnson Hernandez, C., & Wills, S. (2012). *Issues in defining and measuring veteran community integration: Proceedings of the Working Group on Community Reintegration, VA Rehabilitation Outcomes Conference, Miami, Florida*. Retrieved from http://www.rehab.research.va.gov/jour/2012/491/pdf/resnik491.pdf

Resnik, L., Gray, M., & Borgia, M. (2011). Measurement of community reintegration in sample of severely wounded service members. *Journal of Rehabilitation Research & Development*, *48*, 89-102.

Resnik, L., Plow, M., & Jette, A. (2009). Development of CRIS: Measure of community reintegration of injured service members. *Journal of Rehabilitation Research & Development*, *46*, 469-480.

Ross, A. M., & DeVoe, E. R. (2014). Engaging military parents in a home-based reintegration program: A consideration of strategies. *Health & Social Work*, *39*, 47-54.

Ruff, R. (2005). Two decades of advances in understanding of mild traumatic brain injury. *Journal of Head Trauma Rehabilitation*, *20*, 5-18.

Ruff, R. L., Riechers, R. G., & Ruff, S. S. (2010). Relationships between mild traumatic brain injury sustained in combat and post-traumatic stress disorder. *F1000 Medicine Reports*, *2* (64). doi:10.3410/M2-64

Ruff, R. M., Marshall, L. F., Crouch, J., Klauber, M. R., Levin, H. S., Barth, J., . . . Marmarou, A. (1993). Predictors of outcome following severe head trauma: Follow-up data from the Traumatic Coma Data Bank. *Brain Injury*, *7*, 101-111.

Salter, K., McClure, J. A., Foley, N. C., & Teasell, R. (2011). Community integration following TBI: An examination of community integration measures within the ICF framework. *Brain Injury*, *25*, 1147-1154.

Sander, A. M., Clark, A., & Pappadis, M. R. (2010). What is community integration anyway? Defining meaning following traumatic brain injury. *Journal of Head Trauma Rehabilitation*, *25*, 121-127.

Sander, A. M., Fuchs, K. L., High, W. M. Jr., Hall, K. M., Kreutzer, J. S., & Rosenthal, M. (1999). The Community Integration Questionnaire revisited: An assessment of factor structure and validity. *Archives of Physical Medicine and Rehabilitation*, *80*, 1303-1308.

Sayer, N. A. (2012). Traumatic brain injury and its neuropsychiatric sequelae in war veterans. *Annual Review of Medicine*, *63*, 405-419.

Sayer, N. A., Chiros, C. E., Sigford, B., Scott, S., Clothier, B., Pickett, T., & Lew, H. L. (2008). Characteristics and rehabilitation outcomes among patients with blast and other injuries sustained during the Global War on Terror. *Archives of Physical Medicine and Rehabilitation*, *89*, 163-170.

Sayer, N. A., Noorbaloochi, S., Frazier, P., Carlson, K., Gravely, A., & Murdoch, M. (2010). Reintegration problems and treatment interests among Iraq and Afghanistan combat veterans receiving VA medical care. *Psychiatric Services*, *61*, 589-597.

Sayer, N. A., Orazem, R. J., Noorbaloochi, S., Gravely, A., Frazier, P., Carlson, K. F., . . . Oleson, H. (2014, June 11). Iraq and Afghanistan war veterans with reintegration problems: Differences by Veteran Affairs Healthcare user status. *Administration and Policy in Mental Health*. Advance online publication. doi:10.1007/s10488-014-0564-2

Sayers, S. L., Farrow, V. A., Ross, J., & Oslin, D. W. (2009). Family problems among recently returned military veterans referred for a mental health evaluation. *Journal of Clinical Psychiatry*, *70*, 163-170.

Schmidt, M. F., Garvin, L. J., Heinemann, A. W., & Kelly, J. P. (1995). Gender and age-related role changes following brain injury. *Journal of Head Trauma Rehabilitation*, *10*, 14-27.

Schneiderman, A. I., Braver, E. R., & Kang, H. K. (2008). Understanding sequelae of injury mechanisms and mild traumatic brain injury incurred during the conflicts in Iraq and Afghanistan: Persistent postconcussive symptoms and posttraumatic stress disorder. *American Journal of Epidemiology*, *167*, 1446-1452.

Schonberger, M., Ponsford, J., Gould, K. R., & Johnston, L. (2011). The temporal relationship between depression, anxiety, and functional status after traumatic brain injury: A cross-lagged analysis. *Journal of the International Neuropsychological Society*, *17*, 781-787.

Seel, R. T., Kreutzer, J. S., Rosenthal, M., Hammond, F. M., Corrigan, J. D., & Black, K. (2003). Depression after traumatic brain injury: A National Institute on Disability and Rehabilitation Research Model Systems multicenter investigation. *Archives of Physical Medicine and Rehabilitation*, *84*, 177-184.

Seel, R. T., Macciocchi, S., & Kreutzer, J. S. (2010). Clinical considerations for the diagnosis of major depression after moderate to severe TBI. *Journal of Head Trauma Rehabilitation*, *25*, 99-112.

Skodol, A. E., & Bender, D. S. (2000). Diagnostic interviews for adults. In A. J. Rush, H. A. Pincus, M. B. First, D. Blacker, J. Endicott, & S. J. Keith (Eds.), *Handbook of psychiatric measures* (pp. 45-70). Washington, DC: American Psychiatric Press.

Stalnacke, B. M. (2007). Community integration, social support and life satisfactions in relationship to symptoms 3 years after mild traumatic brain injury. *Brain Injury*, *21*, 933-942.

Tanev, K. S., Pentel, K. Z., Kredlow, M. A., & Charney, M. E. (2014). PTSD and TBI co-morbidity: Scope, clinical presentation and treatment options. *Brain Injury*, *28*, 261-270.

Tanielian, T., & Jaycox, L. H. (Eds.). (2008). *Invisible wounds of war: Psychological and cognitive injuries, their consequences, and services to assist recover*. Santa Monica, CA: RAND Corporation.

Tanielian, T., Jaycox, L. H., Adamson, D. M., & Metscher, K. N. (2008). Introduction. In T. Tanielian & L. H. Jaycox (Eds.), *Invisible wounds of war: Psychological and cognitive injuries, their consequences, and services to assist recovery* (pp. 3-17). Santa Monica, CA: RAND Corporation.

Taylor, B. C., Hagel, E. M., Carlson, K. F., Cifu, D. X., Cutting, A., Bidelspach, D. E., & Sayer, N. A. (2012). Prevalence and costs of co-occurring traumatic brain injury with and without psychiatric disturbance and pain among Afghanistan and Iraq War Veteran VA users. *Medical Care*, *50*, 342-346.

Terrio, H., Brenner, L. A., Ivins, B. J., Cho, J. M., Helmick, K., Schwab, K., . . . Warden, D. (2009). Traumatic brain injury screening: Preliminary findings in a US Army Brigade Combat Team. *Journal of Head Trauma Rehabilitation*, *24*, 14-23.

Trudel, T. M., Nidiffer, F. D., & Barth, J. T. (2007). Community-integrated brain injury rehabilitation: Treatment models and challenges for civilian, military, and veteran populations. *Journal of Rehabilitation Research & Development*, *44*, 1007-1016.

U.S. Department of Veterans Affairs. (2011). *Combat veteran eligibility* (VA Fact Sheet 16-4). Retrieved from http://www.va.gov/healthbenefits/assets/documents/publications/FS16-4.pdf

U.S. Department of Veterans Affairs, Epidemiology Program. (2014). *Analysis of VA Health Care Utilization among Operation Enduring Freedom, Operation Iraqi Freedom, and Operation New Dawn Veterans: Cumulative from 1st Quarter FY 2002 through 4th Quarter FY 2013*. Retrieved from http://www.publichealth.va.gov/docs/epidemiology/healthcare-utilization-report-fy2013-qtr4.pdf

Uysal, S., Hibbard, M. R., Robillard, D., Pappadopulos, E., & Jaffe, M. (1998). The effect of parental traumatic brain injury on parenting and child behavior. *Journal of Head Trauma Rehabilitation*, *13*, 57-71.

Vogt, D. (2011). Mental health-related beliefs as a barrier to service use for military personnel and veterans: A review. *Psychiatric Services*, *62*, 135-142.

Wall, P.L. (2012). Posttraumatic stress disorder and traumatic brain injury in current military populations: A critical analyses. *Journal of the American Psychiatric Nurses Association*, *18*, 278-298.

Warden, D. L. (2006). Military TBI during the Iraq and Afghanistan wars. *Journal of Head Trauma Rehabilitation*, *21*, 398-402.

Williams, W. H., & Evans, J. J. (2003). Brain injury and emotion: An overview to a special issue on biopsychosocial approaches in neurorehabilitation. *Neuropsychological Rehabilitation*, *13*, 1-11.

Willemse-van Son, A. H., Ribbers, G. M., Hop, W. C., & Stam, H. J. (2009). Community integration following moderate to severe traumatic brain injury: A longitudinal investigation. *Journal of Rehabilitation Medicine*, *41*, 521-527.

Williamson, G. M., & Schulz, R. (1990). Relationship orientation, quality of prior relationship, and distress among caregivers of Alzheimer's patients. *Psychology and Aging*, *5*, 502-509.

Williamson, G. M., & Schulz, R. (1995). Caring for a family member with cancer: Past communal behavior and affective reactions. *Journal of Applied Social Psychology*, *25*, 93-116.

Williamson, G. M., & Shaffer, D. R. (2001). Relationship quality and potentially harmful behaviors by spousal caregivers: How we were then, how we are now. The Family Relationships in Late Life Project. *Psychology and Aging*, *16*, 217-226.

Winkler, D., Unsworth, C., & Sloan, S. (2006). Factors that lead to successfully community integration following severe traumatic brain injury. *Journal of Head Trauma Rehabilitation*, *21*, 8-21.